Bioimpedance Body Hydration Monitor

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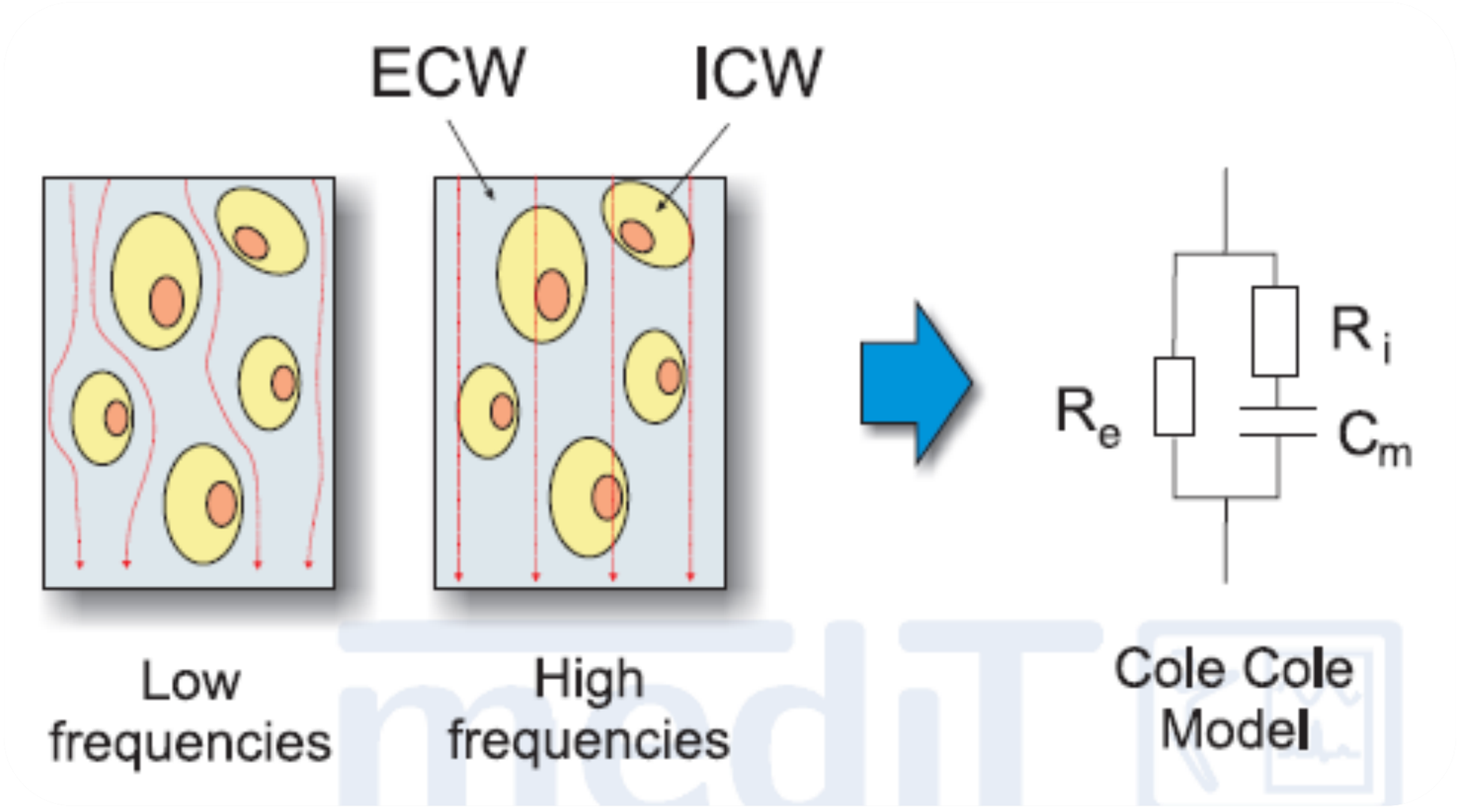
Introduction

- Emergency departments struggle to attain timely data of a patient's hydration.
- Lack of hydration data can lead to harmful treatment options being prescribed.
- Common hydration measurement techniques are invasive and expensive.

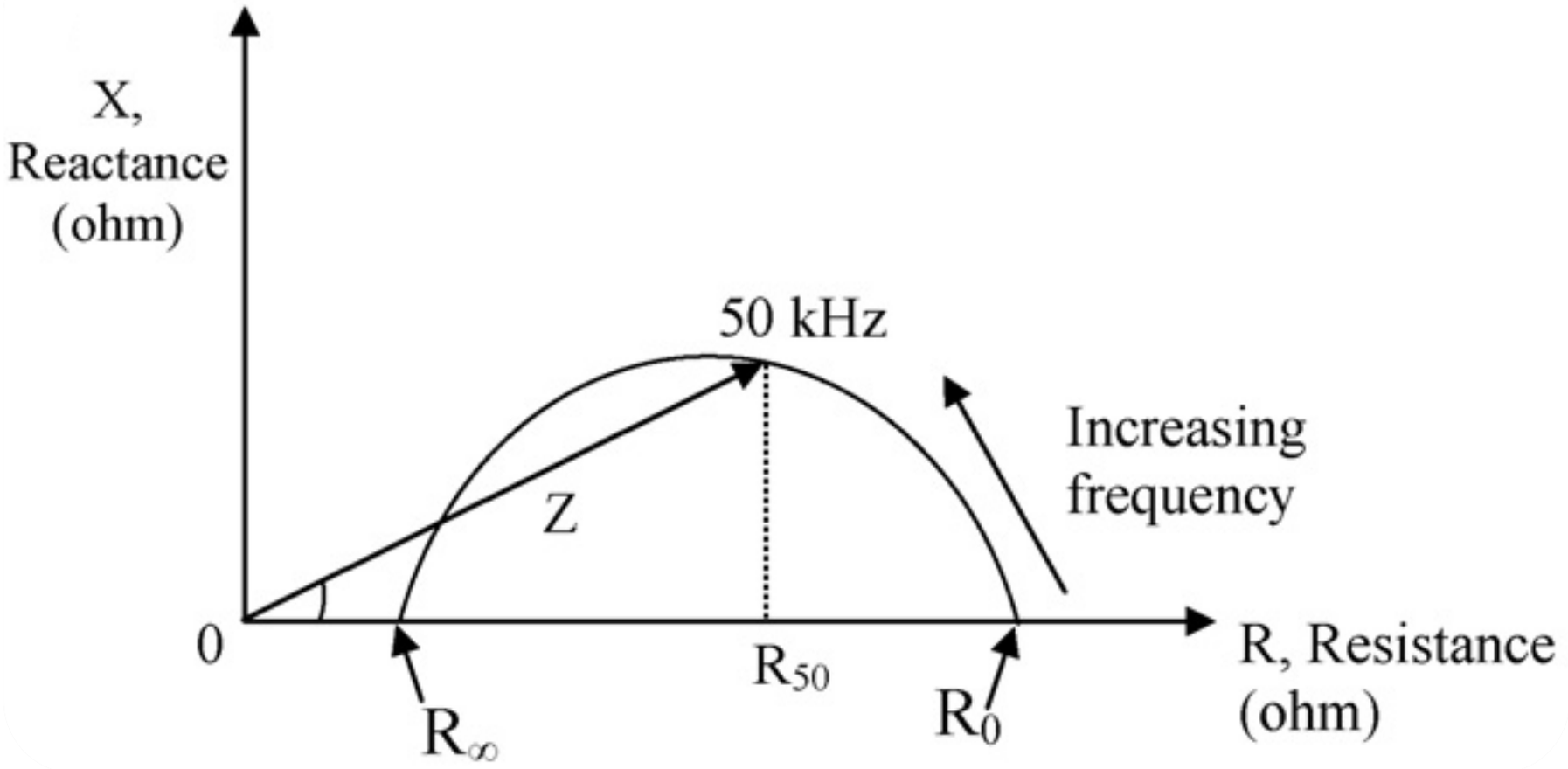
Bioimpedance Analysis



Röthlingshöfer et al., J. Elec. Bioimpedance **2**, 2011

Bioimpedance Analysis

- Cole-Cole Model



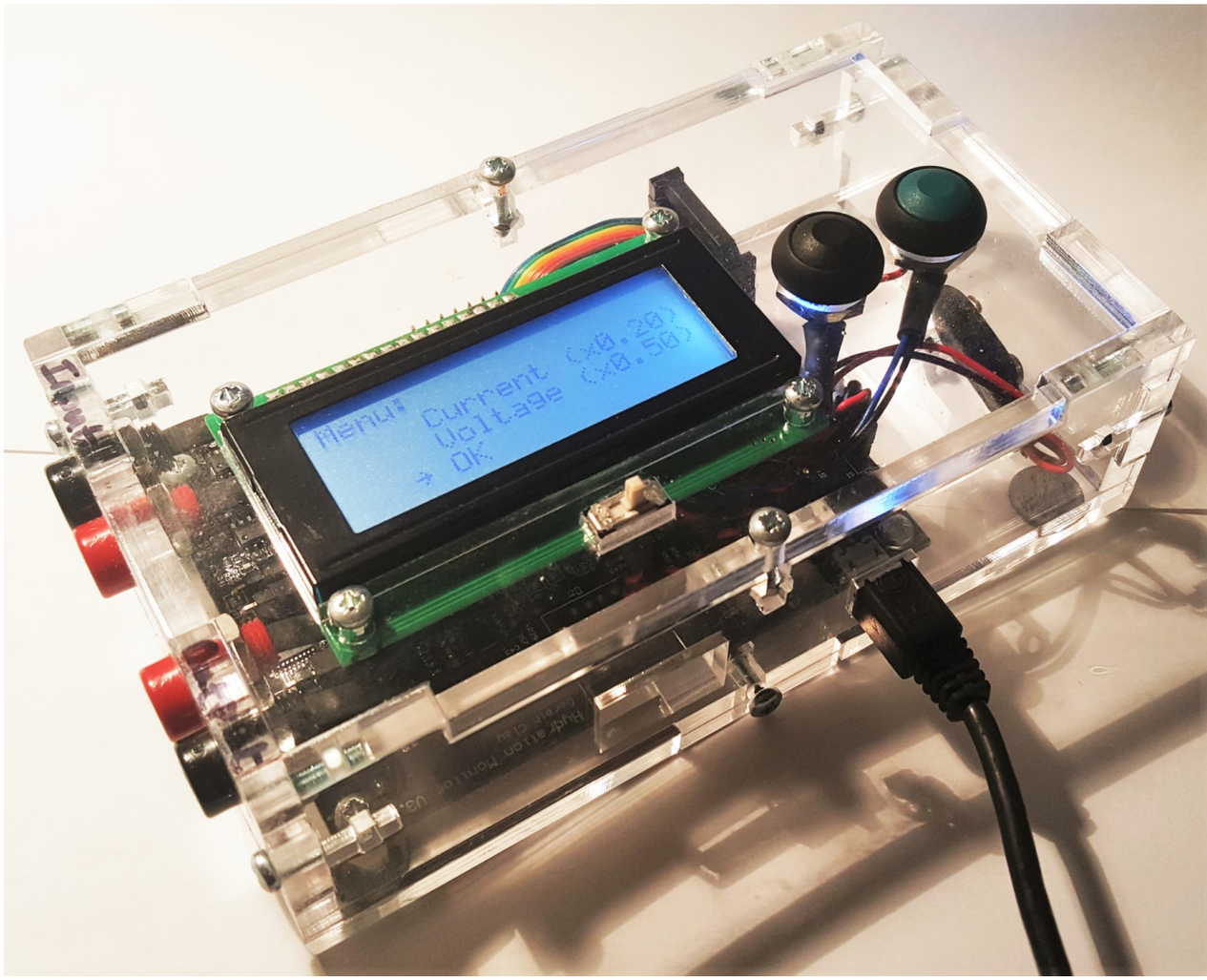
Jaffrin & Morel, Med. Eng. Phys. **30**, 2008

Project Goals

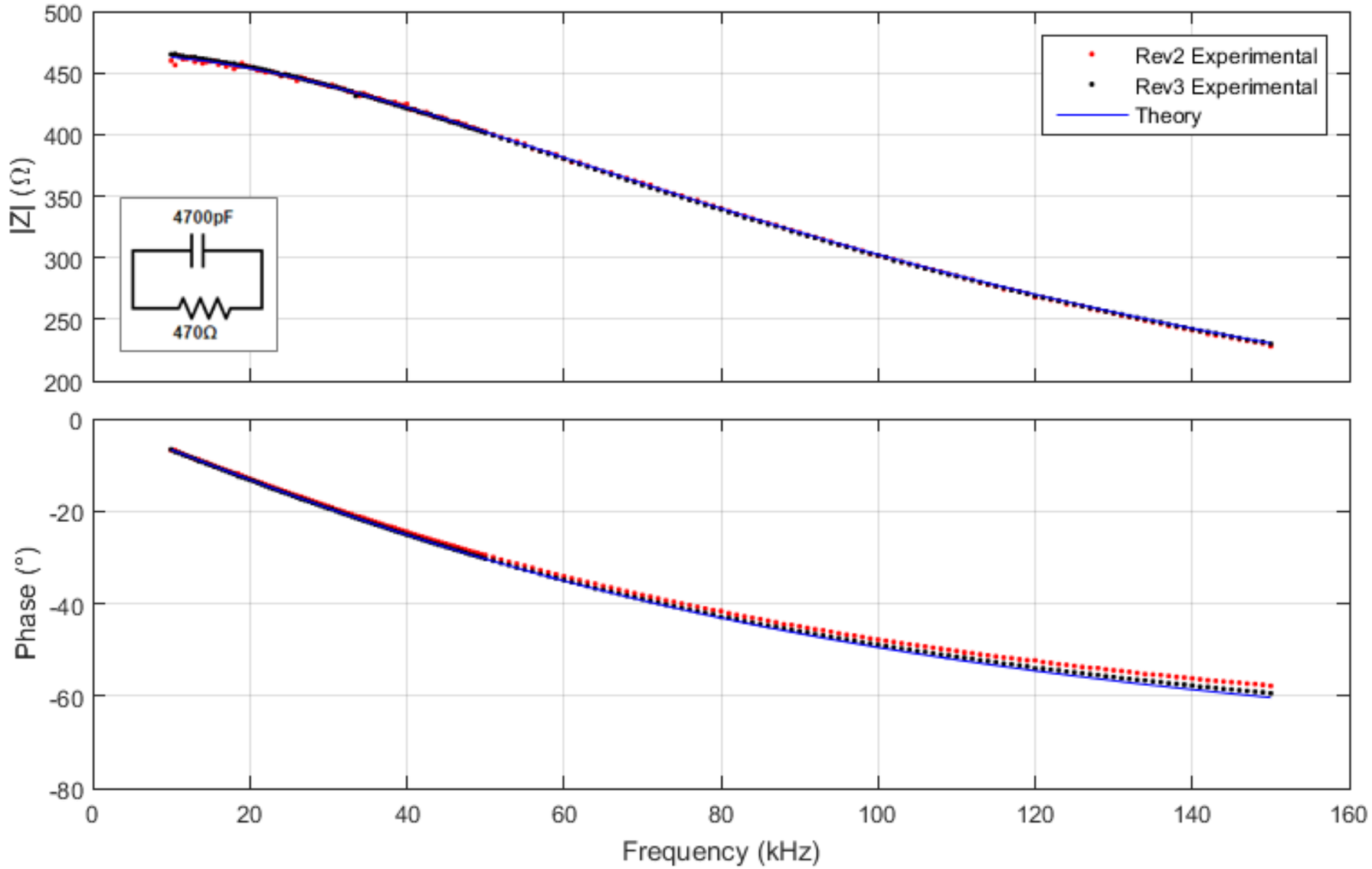
- Build a device to measure bioimpedance
- Record data & report visually
- Use phantoms to verify accuracy & precision
- Measure hydration trend data in volunteer

Device Specifications

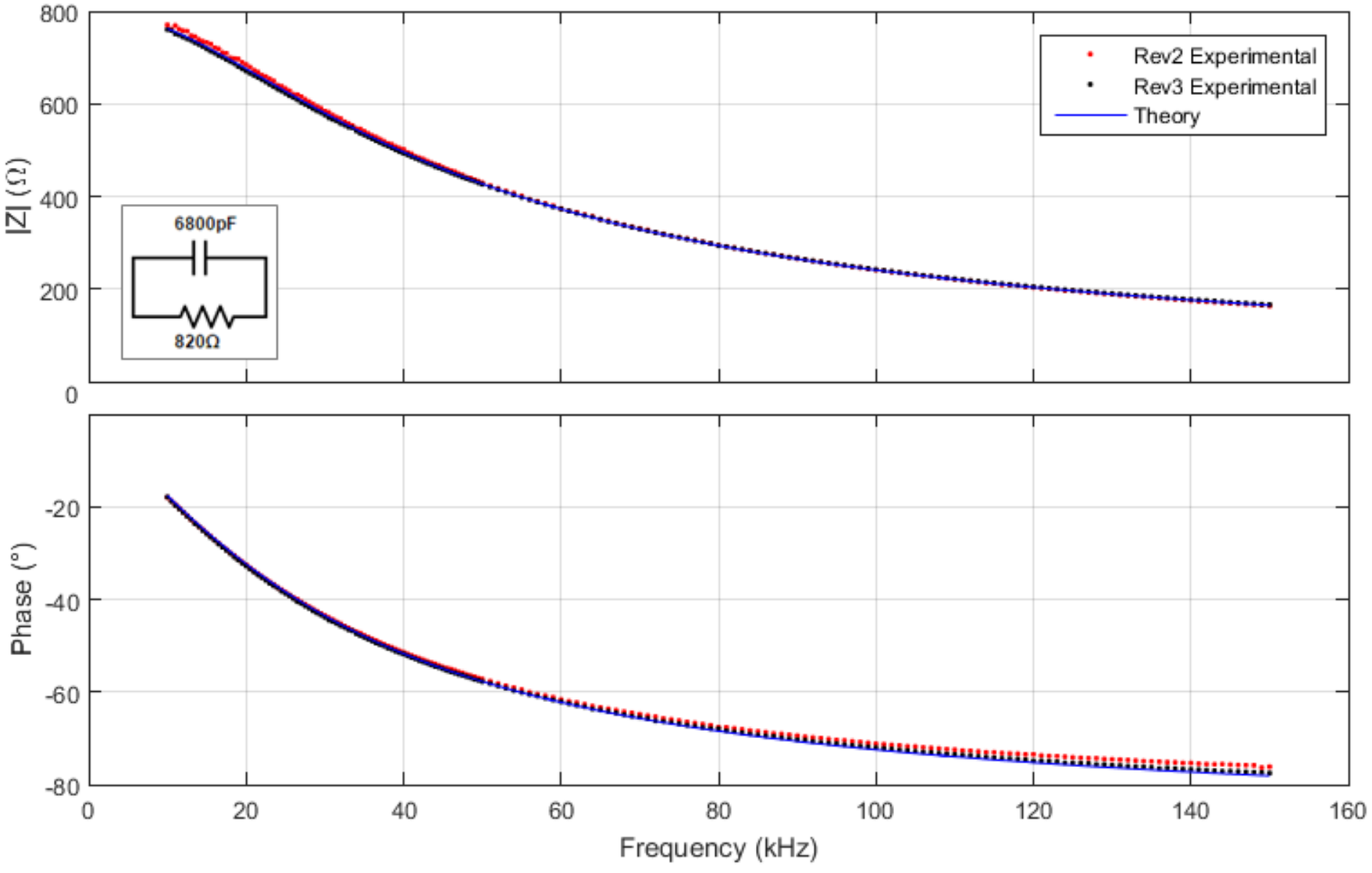
- 180 measurements
  from 10 kHz to 150 kHz
- magnitude to 1%
  phase to 5%
- R_∞ & R_0 repeatable to
  1% across 20 tests



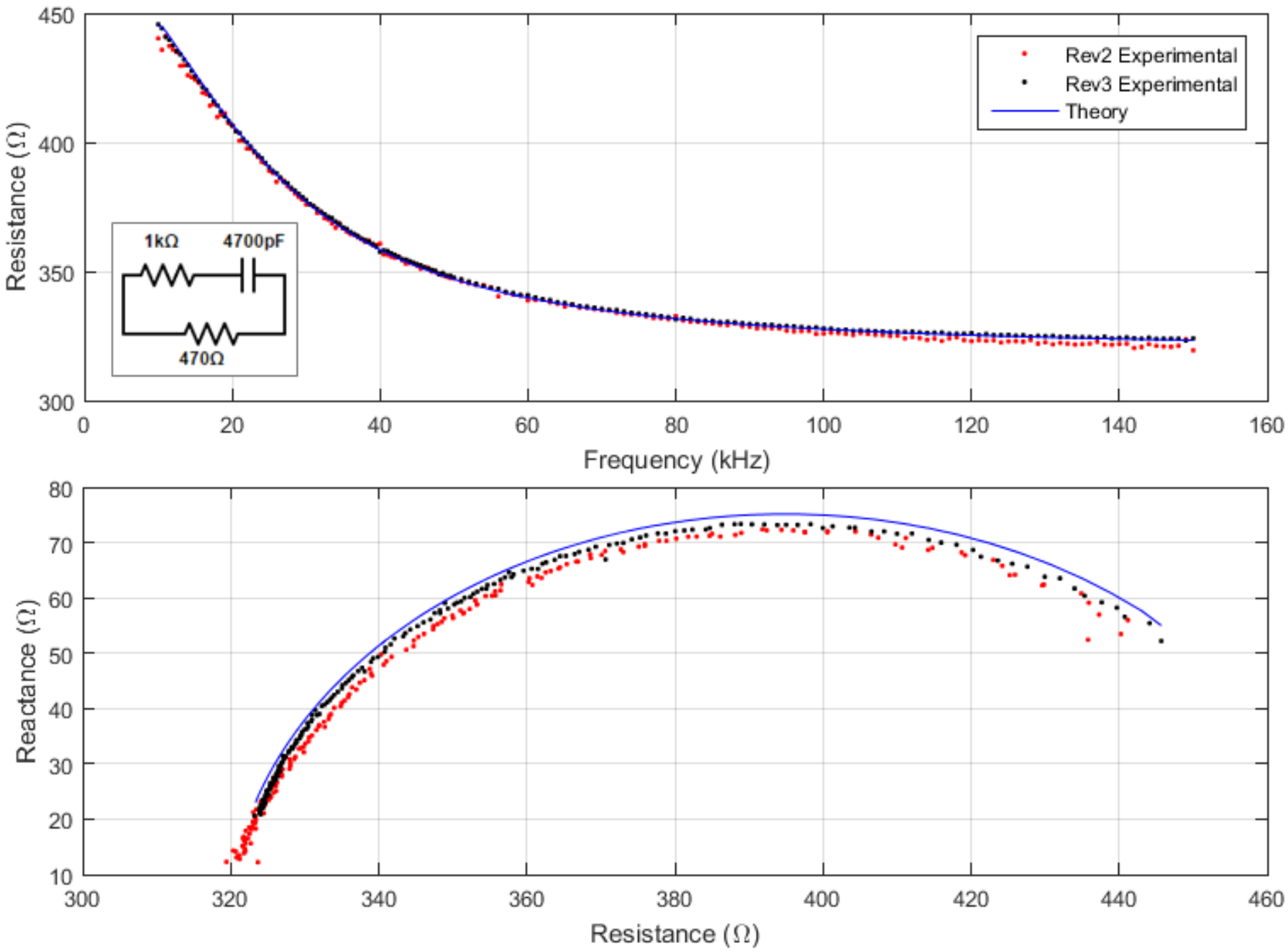
Calibration Results



Calibration Results

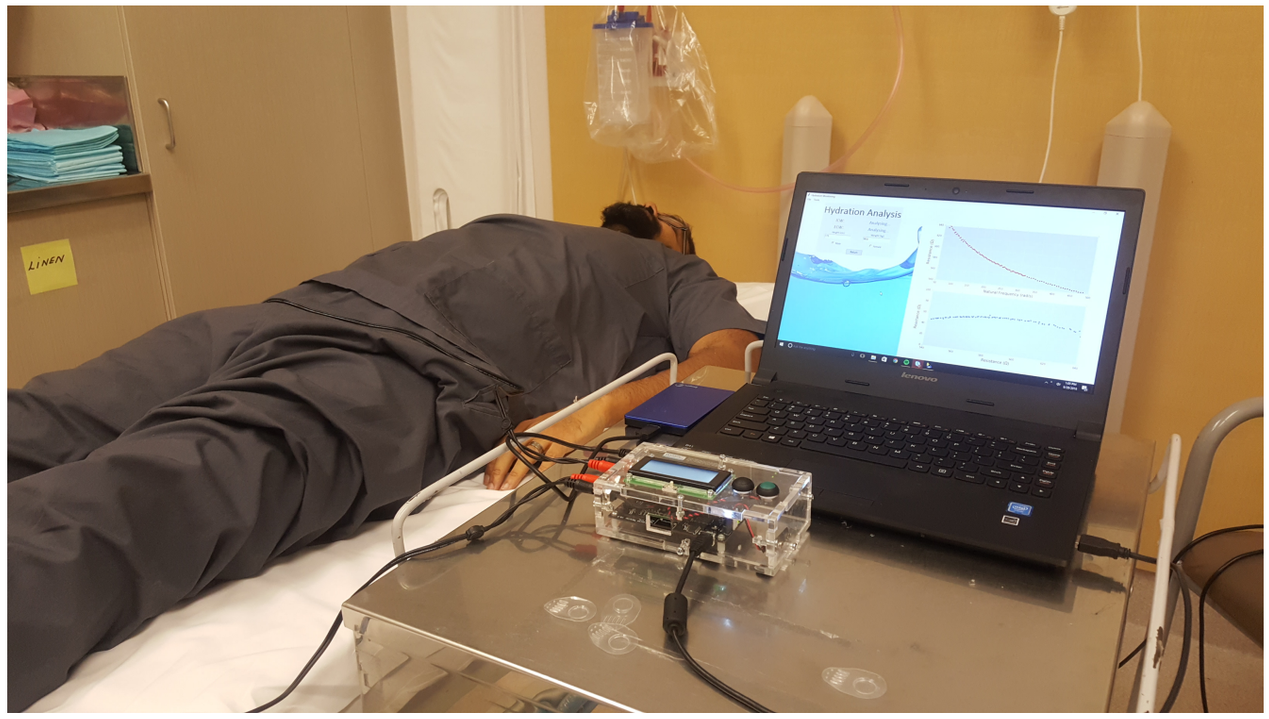


Calibration Results



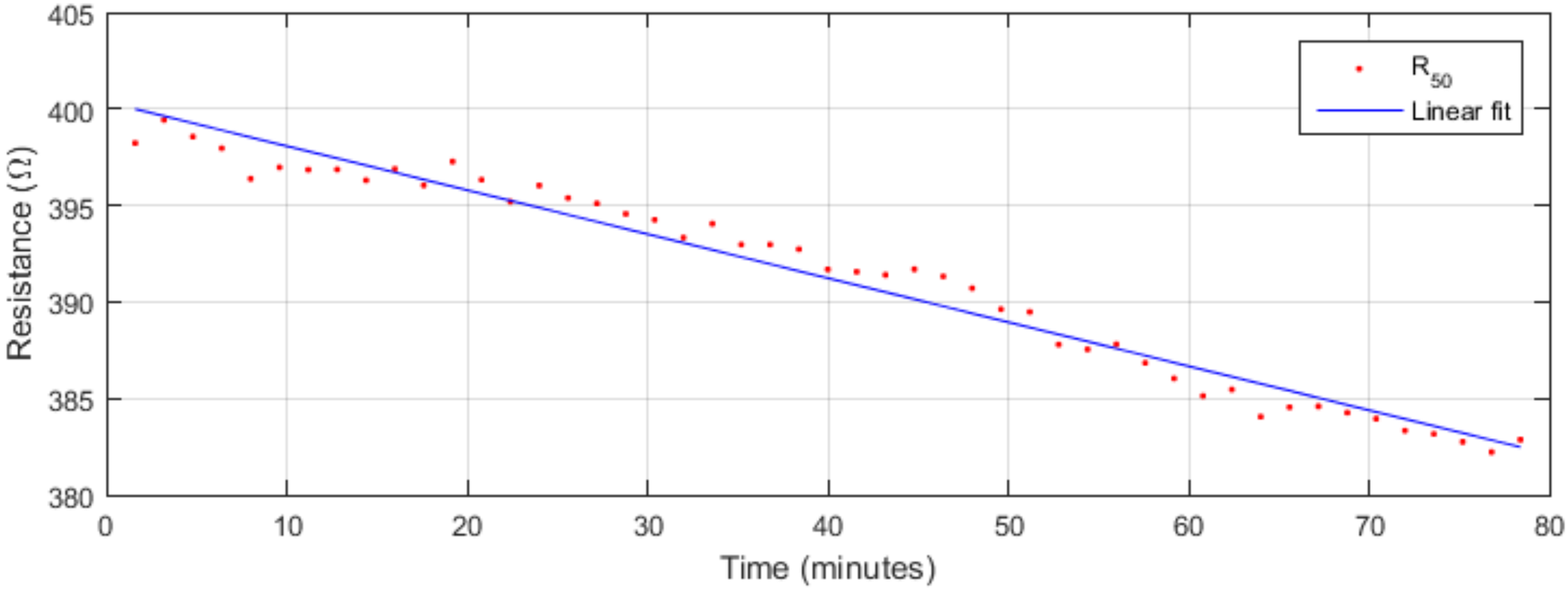
Measuring Hydration

- 2 *l* 0.9% NaCl administered intravenously
- 50 measurements taken over 80 minutes



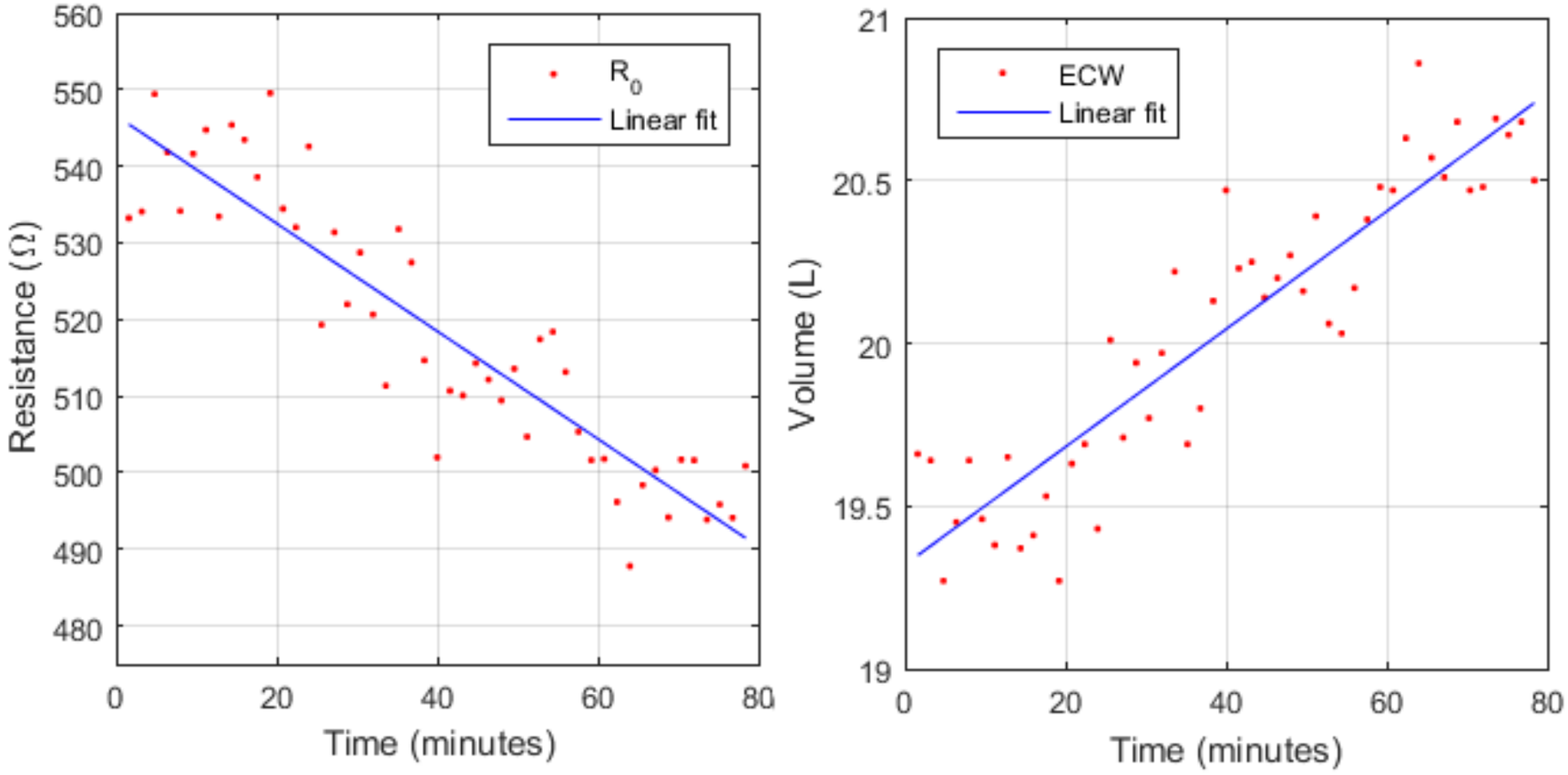
Measuring Hydration

- 2 *l* of fluid administered



Measuring Hydration

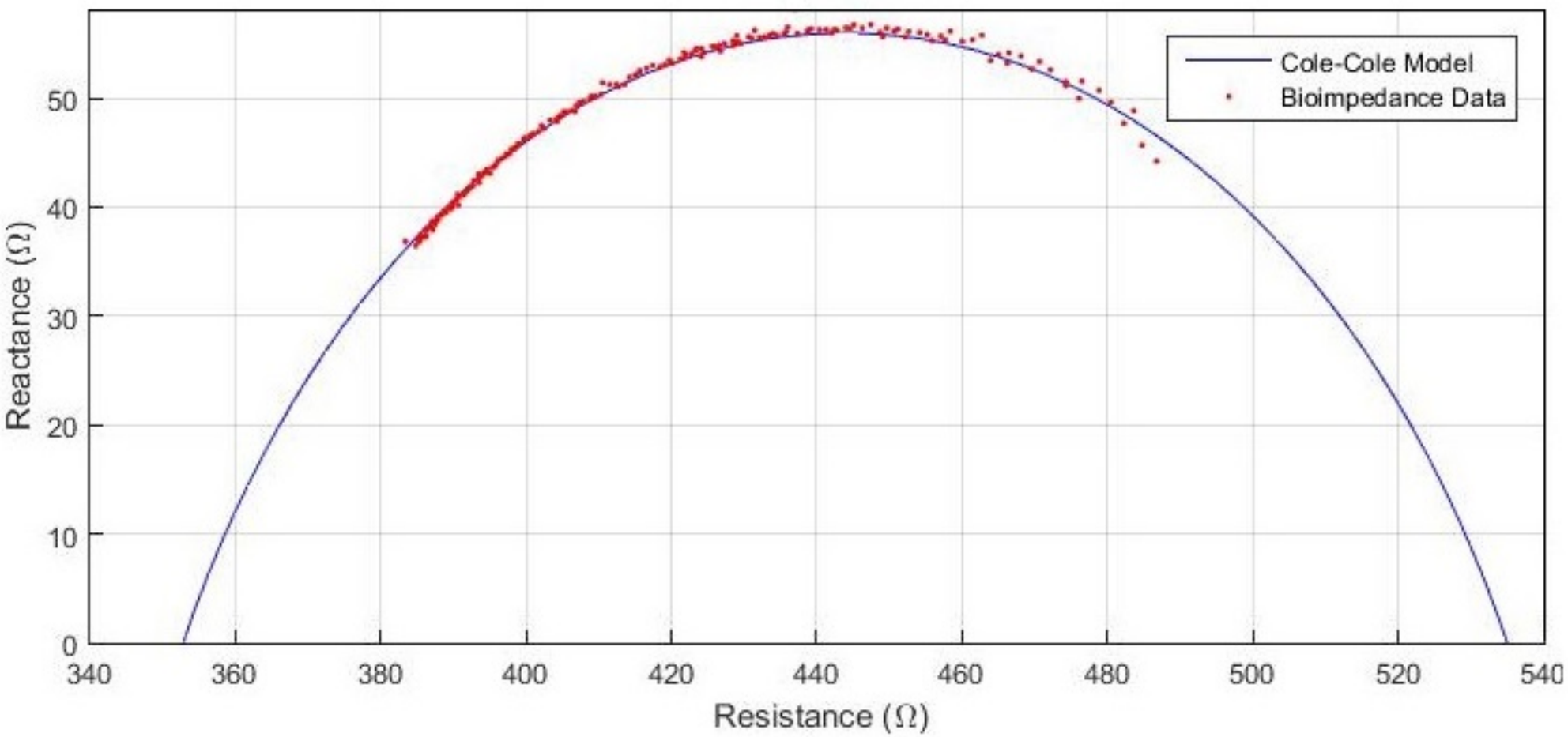
- 2 *l* of fluid administered



- ECW increased by 1.39 ± 0.42 *l*

Measuring Hydration

- 2 *l* of fluid administered
- ICW "decreased" by 2.09 ± 2.93 *l*



Conclusion

- Functional prototype built
- Measurement range from 10 kHz to 150 kHz
- ECW trend data clear from volunteer patient data